Digital phase meter displays angles in degrees or radians

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In this unit, the phase angle between two signals is measured and displayed digitally, and so the instrument is less costly than its counterparts that use precision linear circuits and expensive meter movements. The angle can be displayed in degrees, radians, or grads (400 grads = 360°). The accuracy of the instrument is ±1 least significant count, independent of signal differences in amplitude or wave shape.

Generally, the reference and test signals are applied to channel A and channel B, respectively, as shown in the figure. Q_1 and Q_2 generate short pulses (i.e. less than 30 microseconds) to the counting logic as each signal passes upward through its zero-crossing point. To initiate the counting cycle, the logic circuit simply gates the output of an oscillator through to the 74192 counters on the first zero-crossing pulse from Q_1. The zero-crossing pulse from Q_2 terminates the count. The number displayed thus represents the phase difference expressed in the desired units, provided A_1's frequency is appropriately selected.

The instrument is calibrated by placing S_1 in the set position, introducing a reference signal, and depressing the sample-count push button as A_1 is adjusted for a display output of 360 (if output in degrees is desired), 400 (in grads), or 628 (in radians).

In normal operation, depressing the sample-count push button initiates the count cycle. Flip-flop A_2 is preset and fires one-shot A_3, whereupon the display is cleared.

Q_1's first pulse sets flip-flops A_4 and A_5 and gates A_1's output through to the 74192 counters. With a pulse from Q_2, flip-flop A_6 is set, and the output of the NAND gate driving the counters is disabled. Meanwhile, A_2 is cleared in order that the unit may then be readied for a new sample count.

The phase angles will be displayed directly. Provision should be made, however, for activating the decimal point to the right of the left-most digit when radians are displayed. □
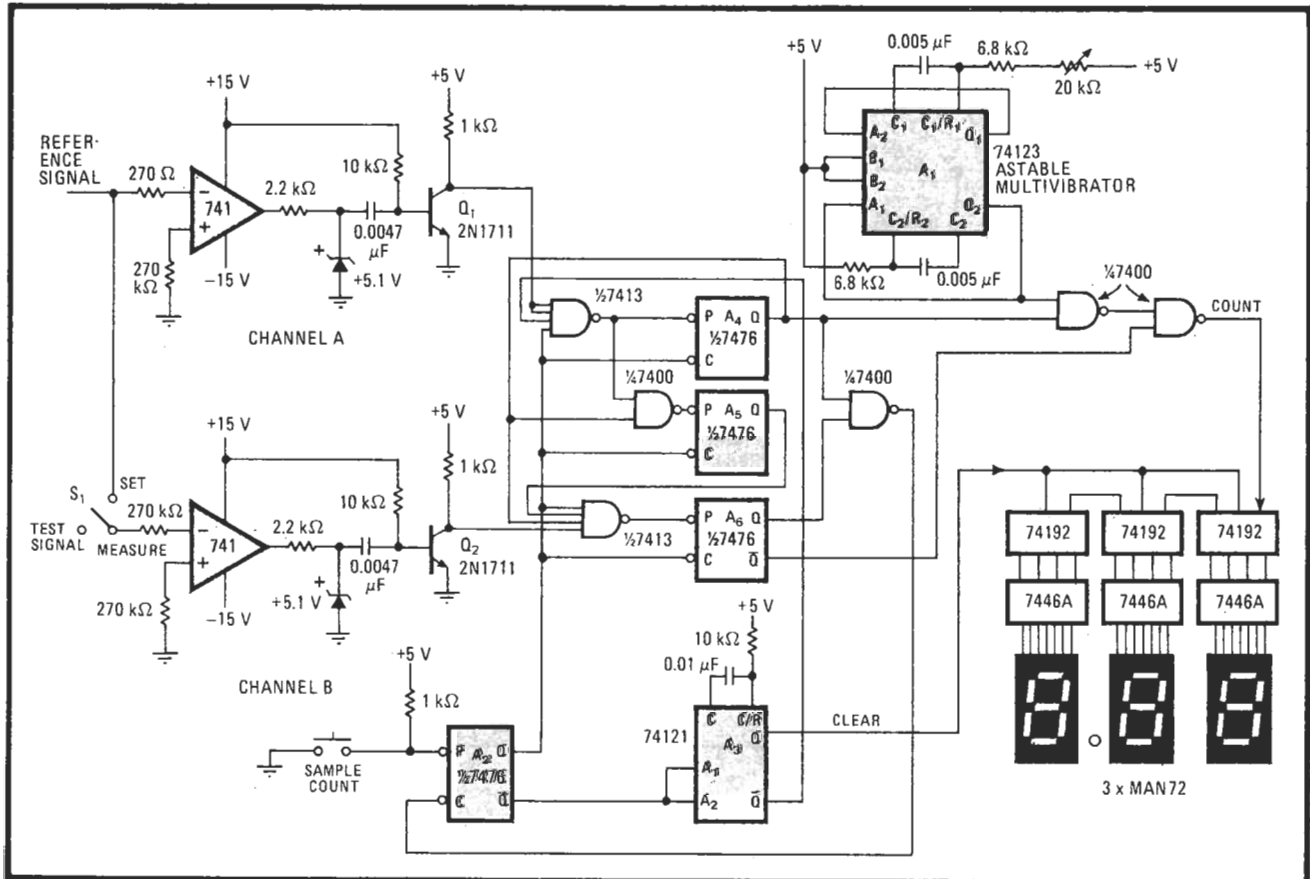
Digital differential. Phase angle between two signals is determined to within ±1 least significant count. Using standard chips, angle is digitally measured and can be displayed in degrees, radians, or grads, provided frequency of counting oscillator, A_1, is appropriately selected.